where n is the number of SQUIDS in the chain. A small portion of the output voltage may be placed across a resistor (not shown) to generate a current which is sent through the chain of feedback coils **912**. The current in feedback coils **912** is then used to modify the voltage in SQUIDS **910** in a controlled manner, in order to increase the linearity of the amplifier **900** by causing the SQUIDS to operate in a smoother region of their flux curve. This reduces the voltage across the SQUID chain slightly (and thus reduces the gain of the amplifier) but increases the linearity and usefulness of the amplifier.

Note that the feedback coils could also have damping elements placed across their coils, but this is not needed in single coil elements like those shown in FIG. **9**.

FIGS. **10**A–**10**D shows voltage-flux plots illustrating the performance of array **900** at various damping levels (amounts of resistance in resistors **908**). FIG. **10**A shows the voltage-flux plot of array **900** when no resistors **908** are used (resistance of resistors **908** would be infinite, i.e., they are not used). FIG. **10**B shows the voltage-flux plot of array **900** with a large amount of resistance, 1.9 ohms/turn (i.e. a small amount of damping) provided by resistors **908**. FIG. **10**C shows the voltage-flux plot of array **900** with a moderate amount of resistance, 0.75 ohms/turn (i.e. a moderate amount of damping) provided by resistors **908**. FIG. **10**D shows the voltage-flux plot of array **900** with a small amount of resistance, 0.08 ohms/turn (i.e. a large amount of damping) provided by resistors **908**. The SQUID array bias current is 60 mA for the bottom curve on each plot, and 80, 100, and 120 for each successively higher curve on each plot. Note that the distortions in FIG. **10**A (no damping) are severe, while the curves in FIG. **10**D (a large amount of damping) are nearly ideal.

FIG. **11** shows a device **1100** comprising a planar geometry superconducting coil **1104** in conjunction with a ground plane **1102**, and utilizing intracoil shunt **1106**. Intracoil shunt **1106** damps resonances in coil **1104** by connecting the turns of coil **1104** with resistive elements. Coil **1104** may be used as an inductor, or as either a primary or secondary winding in a transformer, or in other application requiring a planar geometry superconducting coil used in conjunction with a ground plane.

FIGS. **12**A and **12**B show two other embodiments of damped planar geometry superconducting coils **1204**, **1214** in conjunction with ground plane **1202**, **1212**. These figures illustrate that resistive elements **1206**, **1216** may have a variety of geometries or placements. FIG. **12**A illustrates a large resistor **1206** placed radially across coils **1204**. The width of resistor **1206** is one method of targeting the ohms/turn. Given a fixed resistor sheet thickness, resistor values are set by the length and width of the “bar” connecting two conductors. The resistance increases with increased length and decreases with increased thickness (the length is fixed in this application unless the resistor sheet is placed at an angle across the turns).

FIG. **12**B illustrates a plurality of resistors placed radially across coils **1214** at various points. Those skilled in the art will appreciate that a wide variety of geometries and locations of resistors provides effective damping to planar geometry superconducting coils, including SQUIDS.

While the exemplary preferred embodiments of the present invention are described herein with particularity, those skilled in the art will appreciate various changes, additions, and applications other than those specifically mentioned, which are within the spirit of this invention.

What is claimed is:

1. Apparatus for damping resonances in a planar geometry multiturn superconducting coil comprising:

an intracoil resistive shunt electrically connecting a plurality of turns of the coil with resistors, wherein the resistive shunt is substantially within the perimeter of the coil.

2. The apparatus of claim **1** wherein the shunt comprises a linear planar-film resistor.

3. The apparatus of claim **1** wherein the shunt comprises multiple linear planar-film resistors.

4. A damped superconductor coil comprising:

a planar geometry multiturn superconducting coil; and

an intracoil resistive shunt electrically connecting a plurality of turns of the coil with resistors, wherein the shunt is substantially within the perimeter of the coil.

5. The apparatus of claim **4**, further including:

an electrical ground plane parallel and proximate to the coil.

6. The apparatus of claim **5**, wherein the electrical ground plane consists of a superconductive material and forms at least one hole which concentrates magnetic field lines from the coil to the hole.

7. The apparatus of claim **6**, wherein the ground plane additionally forms a gap extending from the hole to the edge of the ground plane to admit changing magnetic flux.

8. The apparatus of claim **7** wherein the coil is a signal coil of a superconducting quantum interference device (SQUID).

9. The apparatus of claim **7** wherein the coil in a modulation coil of a superconducting quantum interference device (SQUID).

10. The apparatus of claim **7** wherein the coil is an inductor in an amplifier.

11. The apparatus of claim **7** wherein the coil is a winding in a transformer.

12. The apparatus of claim **4** wherein the shunt comprises a linear planar-film resistor.

13. The apparatus of claim **12** further including:

an electrical ground plane parallel and proximate to the coil.

14. The apparatus of claim **13**, wherein the electrical ground plane consists of a superconductive material and forms at least one hole which concentrates magnetic field lines from the coil to the hole.

15. The apparatus of claim **14**, wherein the ground plane additionally forms a gap extending from the hole to the edge of the ground plane to admit changing magnetic flux.

16. The apparatus of claim **15** wherein the coil is a coil of a superconducting quantum interference device (SQUID).

17. The apparatus of claim **15** wherein the coil is an inductor in an amplifier.

18. The apparatus of claim **15** wherein the coil is a winding in a transformer.

19. The apparatus of claim **4** wherein the shunt comprises multiple linear planar-film resistors.

20. An improved superconducting quantum interference device (SQUID) of the type having a signal coupling coil and a feedback coupling coil, the improvement comprising:

at least one of the signal coupling coil and the feedback coupling coil further includes an intracoil resistive shunt electrically connecting a plurality of turns of the coil with resistors, wherein the resistive shunt is substantially within the perimeter of the coil.

21. The apparatus of claim **20** wherein the shunt is a linear planar film resistor.